

Determinants contributing for poor adherence to antiretroviral therapy: A hospital record-based study in Balasore, Odisha

Mallicka Gupta¹, Sai Chandan Das²

¹Department of Community Medicine, Mayo Institute of Medical Sciences, Lucknow, Uttar Pradesh, ²Department of Community Medicine, Government Medical College and Hospital, Balasore, Odisha, India

ABSTRACT

Context: Over the years, because of the increase in the awareness among the population and strong political will, people have better access to services for diagnosis and treatment of the HIV and it is ensured that their confidentiality is maintained. To attain good results from Antiretroviral therapy (ART), high level of sustained adherence to ART is essential. High level of adherence to ART (at least 95%) is needed to ensure optimal benefits. **Objective:** The objective of the study is to find out the proportion of patients who did not adhere to ART and its associated factors among people living with HIV/AIDS attending ART center of a tertiary care government hospital in Balasore, Odisha. **Settings and Design:** This was a hospital record-based study. **Subjects and Methods:** Overall, 131 HIV-positive individuals were selected from hospital records using simple random sampling technique. **Statistical Analysis Used:** Data analysis used SPSS version 20.0. Chi-square test and logistic regression were used to identify determinants affecting nonadherence to ART. **Results:** The mean age of the study participants was 33 years \pm 7 SD. The study data revealed that 47.3% of the study subjects were on ART for less than 24 months. There was a statistically significant association between duration of ART and adherence rate ($P = 0.036$), and using logistic regression, we found that patients who were on ART for less than 24 months are 2.1 times more at risk of becoming nonadherent. Of the total, 48% of patients are suffering from the concurrent infection. There was also a statistically significant association found between opportunistic infection and nonadherence to ART. **Conclusion:** This study has shown that the duration of treatment and opportunistic infections were factors associated with nonadherence to medication.

Keywords: ART, determinants, poor adherence, proportion

Introduction

In 2017, 36.9 million people were living with HIV globally. Among them, only 21.7 million people were receiving ART by the end of 2017. In India with a total population of approximately 1339 million, estimated adult (15–44) prevalence of HIV in the country is 0.2%. Estimated ART coverage in the country is 56%.^[1] Over the past 30 years, there has been drastic change in antiretroviral therapy. Zidovudine was one of the earliest

anti-HIV drugs, which was approved by the United States in 1987. Over the decades, many drugs were discovered and these were then made available for people living with HIV. There are different challenges at present which create hindrances for an individual, as a result of which they do not remain compliant with the treatment. In countries like ours where growing population is a major problem, it brings about other problems too when it comes to accessibility of health-related services. Being diagnosed with HIV is considered as stigma not only in India but in major parts of the world. The society usually outcast such individuals or the person himself/herself tries to end their life. Over the years because of the increase in the awareness among the population and strong political will, people have better access to services for

Address for correspondence: Dr. Sai Chandan Das,
Department of Community Medicine, Government
Medical College and Hospital, Balasore, Odisha, India.
E-mail: drsaidas8@gmail.com

Access this article online

Quick Response Code:



Website:
www.jfmipc.com

DOI:
10.4103/jfmipc.jfmipc_40_19

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Gupta M, Das SC. Determinants contributing for poor adherence to antiretroviral therapy: A hospital record-based study in Balasore, Odisha. J Family Med Prim Care 2019;8:1720-4.

diagnosis and treatment of the HIV and it is ensured that their confidentiality is maintained. To attain good results from ART, high level of sustained adherence to ART is essential. High level of adherence to ART (at least 95%) is needed to ensure optimal benefits.^[2] WHO defines treatment adherence as “the extent to which a person’s behaviour – taking medications, following a diet and/or executing lifestyle changes – corresponds with agreed recommendations from a health care provider”.^[1] For ART, high level of sustained adherence is necessary to (1) suppress viral replication and improve immunological and clinical outcomes, (2) decrease the risk of developing drug resistance, and (3) reduce the risk of transmitting HIV.

Adherence to the antiretroviral treatment is the only way through which people living with HIV can lead a healthy life as the disease is incurable till date. There are several factors which influence the adherences to the therapy like age, sex, education occupation, whether the family members know about the disease, support from family and spouse and from work place, side effects of the drugs, and access to the ART center.^[3]

Considering the sensitivity of the disease, not many studies have been done in the past, especially in this region of the state. This study, therefore, planned to find out the proportion of nonadherence to ART and its associated factors among people living with HIV/AIDS (PLWHA) attending ART center of a tertiary care government hospital in Balasore, Odisha.

Subjects and Methods

This is a descriptive secondary data analysis of hospital records in the ART center of Government Medical College and Hospital, Balasore, Odisha. It was conducted during August–December, 2018. The ART center is run under Odisha State AIDS Control Society, National AIDS Control Organization under the National Aids Control Programme by Government of India. This ART clinic is the main service provider not only to the urban and rural residents of Balasore district but also for the inhabitants of the neighboring two districts. The ART center has been functional since 2010. Ethical clearance was obtained from the Research Ethics Committees of the Medical College and written permission was sought from the Chief District Medical Officer and Nodal officer-in-charge of the ART center. Due to unavailability of any recent article on nonadherence rate to ART in Odisha, assuming nonadherence level as 11% taking reference from a study conducted in North India,^[4] and an absolute precision of 5%, the total sample size required was calculated to be 150 [formula used: $n = \frac{z^2 pq}{e^2}$, where n is the sample size, z is the value of standard normal deviate 1.96 at 95% confidence interval (CI), P is the prevalence of nonadherence, q is the $1 - p$, and e is the absolute precision]. A three-year retrospective record review (2015–2017) of patients on ART was conducted. The following inclusion criteria were followed for selecting each case file: subjects who are on ART for more than 1 year, age above 18 years, and case files of patients only from rural areas of Balasore district. Exclusion criteria were as follows: adult patients who were lost

to follow-up (LFU); chronically ill patients, whose relatives are coming frequently to collect medicine; and pregnant and lactating mothers in WHO stage I or II during the study period. A simple random sampling technique using the table of random numbers was used to select 150 case files. One hundred and fifty case files were abstracted in the self-designed pro forma, but only 131 case files could fulfill our inclusion criteria. Hence, it was decided to include 131 ART treatment card. The following details of participants like age, sex, marital status, income, level of education, occupation, religion, any concurrent infection, CD4 T-cell count before starting ART and most recent CD4 count, past and present weight, distance to ART center, duration of treatment, adherence to medication over last 1 month were retrieved from the records. Adherence rate was calculated by dividing number of pills actually taken by the number of pills prescribed during 1 month multiplied by 100.^[2,4] A patient was defined as nonadherent when calculated adherence percentage was <95% of the prescribed doses in the last month.^[4] The comparison of those who were adherent ($\geq 95\%$ of their doses of ART medication taken) and nonadherent ($\leq 95\%$ of their doses of ART medication taken) was carried out with different sociodemographic variables.

Statistical analysis

Data were compiled and analyzed using Microsoft Excel (Microsoft, Redmond, WA, USA) and the statistical package for social sciences version 20.0 (IBM Corp, Version 20.0. Armonk, NY, USA). Data for each parameter were summarized descriptively (e.g., frequencies, mean, mode). The association between different variables in relation to nonadherence to ART was determined using Pearson’s Chi-square test. When 20% of the sample had expected value lower than 5, we used the Fisher exact test or likelihood ratio. We considered significant a $P \leq 0.05$ value. Logistic regression model was used to identify associated factors of adherence rate using odd ratios with 95% CI.

Results

A total of 131 treatment cards were shortlisted after satisfying the inclusion criteria. Table 1 shows predictors of adult HIV patients affecting adherence. The mean age of the study participants was 33 years \pm 7 SD. Majority of them were less than 35 years. In our study, more than 50% were male. Forty five (34.3%) of the respondents had primary education and 50 (38.1%) were higher secondary and above. Regarding marital status, similar proportion of subjects (6.8%) was found to be married and separated. Majority (72%) of PLHIV were single. Marital status, age, and gender of study participants showed no significant effect on the adherence rate. The mean present weight of the subjects was found to be 47 kg \pm 9.5 SD. Among all, more than half earned a monthly income above 2000 INR. Income was not found to have a statistically significant association with adherence rate ($P = 0.767$). One of the possible reasons for this could be due to availability of free treatment.

Majority study participants (71%) traveled less than 150 km to reach the district ART center and almost 28.4% of patients had to travel

Table 1: Predictors of adult HIV patients and its effect on adherence

Variable	n (%)	P	Exp. (B)	95% CI
Age				
≤35 years	87 (66.4)	0.28	1	0.30-1.42
≥35 years	44 (33.5)		0.65	
Gender				
Female	68 (45.2)	0.36	1	0.350-1.471
Male	71 (54.2)		0.71	
Education				
HSC and above	50 (38.1)	0.35	1	
Primary	45 (34.3)		1.17	0.500-2.748
Illiterate	36 (27.4)		1.51	0.623-3.696
Marital status				
Unmarried	95 (72.5)	0.47	1	
Married	9 (6.8)		1.65	0.41-6.58
Separated	27 (20.6)		1.65	0.69-3.94
Income				
≥2000	71 (54.62)	0.74	1	0.430-1.83
≤2000	59 (45.38)		0.88	
Duration on ART				
≥24 months	69 (52.6)	0.03*	1	1.04-4.48
≤24 months	62 (47.3)		2.16	
Distance to ART center				
≤150 km	94 (71.7)		1	
≥150 km	37 (28.4)	0.91	0.95	0.431-2.117
Concurrent infection				
Absent	68 (51.9)	0.003*	1	1.49-6.64
Present	63 (48.0)		3.14	

*Signifies $P < 0.05$

the distance of more than 150 km. But this distance also shows no effect on the adherence rate significantly ($P > 0.05$). The study data revealed that 47.3% of the study subjects were on ART for less than 24 months. An association was found between duration of ART and adherence rate ($P = 0.036$) [Table 2]. We found that patients who were on ART for less than 24 months are 2.1 times more at risk of becoming nonadherent as compared to patients who were on ART since more than 24 months (OR = 2.16; 95% CI = 1.047–4.485; $P = 0.03$) [Table 1].

Of the total, only 48% of the patients were suffering from a concurrent infection like pulmonary TB, diabetes, extrapulmonary TB, and cancer. After applying logistic regression, we found that patients suffering from opportunity infection were 3.14 times more likely to be nonadherent to ART as compared to patient with no history of such infection (OR 3.14; 95% CI 1.4–6.64; $P = 0.003$) [Table 1].

Table 2 describes the demographic and other clinical characteristics. In this study, we found that 47 of the 131 (35.8%) patients had ≤95% adherence to ART on the basis of pill count method as reported in their treatment card. Bigger proportions (98.4%) of patients were on first-line treatment. Fifty-one patients (39%) had their latest CD4 cell count below 500 mm³. HIV status of spouse and children had no significant effect on the adherence rate. The box and whisker plot in Figure 1 gives information of spread of observations in both the groups around a center value. The

Table 2: Sociodemographic and clinical characteristics versus adherence of adult HIV infected patients

Variable	≤95% adherence n (%)	≥95% adherence n (%)	P
Age (in years)			
≤35	34 (39)	53 (60.9)	0.08
36-45	13 (36.1)	23 (63.8)	
≥45	0 (0)	8 (100)	
Gender			
Male	23 (32.3)	48 (67.6)	0.366
Female	24 (40)	36 (60)	
Education			
Illiterate	15 (41.6)	21 (58.3)	0.653
Primary	16 (35.5)	29 (64.4)	
HSC and above	16 (32)	34 (68)	
Religion			
Hindu	47 (36.15)	83 (63.85)	0.453
Muslim	0 (0.0)	1 (100)	
Caste			
General	16 (36)	29 (64.4)	0.956
OBC/SC/ST	31 (36.0)	55 (64)	
Marital status			
Married	4 (44.4)	5 (55.5)	0.511
Separated	3 (33.3)	6 (66.6)	
Widow	9 (50)	9 (50)	
Unmarried	31 (33)	64 (67.3)	
Income			
≤2000	20 (34)	39 (66.1)	0.747
≥2000	26 (36.6)	45 (63.38)	
Duration on ART (in months)			
≤24 months	28 (45.1)	34 (54.8)	0.036*
≥24 months	19 (27.5)	50 (72.46)	
Distance to ART (in km)			
≤150	34 (36.1)	60 (63.8)	0.911
≥150	13 (35.1)	24 (64.8)	
CD4 count			
≤200	6 (42.8)	8 (57.14)	0.44
200-499	19 (37.2)	32 (62.7)	
≥500	12 (27.2)	32 (72.7)	
Spouse HIV status			
Negative	12 (30)	28 (70)	0.44
Positive	25 (37.3)	42 (62.6)	
Children's HIV status			
Negative	33 (33.6)	65 (66.3)	0.54
Positive	7 (41.18)	10 (58.82)	
Type of ART			
First line	47 (36.4)	82 (63.5)	0.286
Second line	0 (0)	2 (100)	
Concurrent infection			
Present	31 (49.1)	32 (50.7)	0.002*
Absent	16 (23.5)	52 (76.4)	

*Statistical significant. P values are based on Chi-square test

distribution pattern and extreme values can be easily viewed by box plot when comparing the drug adherence rate and duration of ART. The median value for less than 95% drug adherence box is 48 months and for more than 95% drug adherence is 36 months. The 25th percentile value for drug adherence is

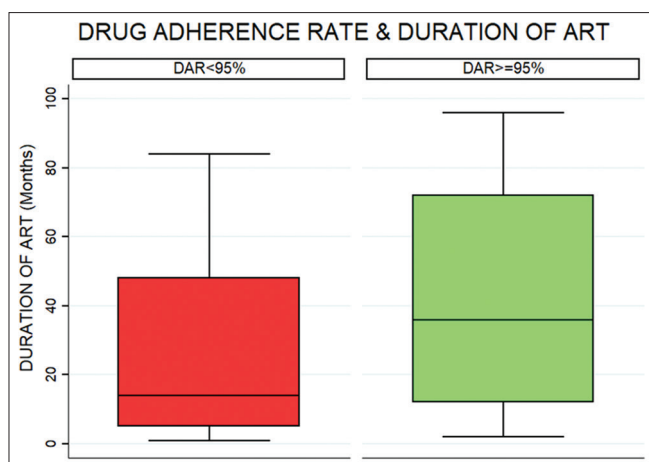


Figure 1: Box and whisker plot showing relationship between duration of drug and drug adherence

5 months for subjects having less than 95% adherence. When comparing the drug adherence rate in both the groups, those on ART for less than 24 months are at risk of remaining lesser adhered to the drug. This is also explained clearly in Table 1.

Discussion

It was observed from the available data of ART center that the proportion of HIV positive patients reporting adherence rate of $\leq 95\%$ is 35.8%. These findings are in accordance with a study done by Achappa *et al.* in South India.^[2] Our result was comparatively low when compared to a study conducted in an ART center of tertiary care hospital in Gujarat, which found that 42.7% of PLWHA show a poor adherence.^[5] Much lower adherence rate was found in other studies conducted in other center.^[4,6] Many similar studies have been done to find out the factors associated with adherence rate. Gender was not found to have any positive significant association with adherence in our study; contrary to our findings, association with gender was found by Lal *et al.*^[7] Similar result showing association of gender and adherence is well explained by Saha *et al.*^[6] Education status of PLWHA showed no significant relationship with nonadherence in our study, similar finding was also reported by Cauldbeck *et al.*^[8] The study data revealed no significant association between drug adherence and age, gender, education status, marital status. Similar results were also obtained by Mehta *et al.*^[5] and Rajesh *et al.*^[9] in which no association was established to the similar sociodemographic variables and adherence. Our study did not show any association between age and adherence, this finding is not in agreement with other studies.^[9,10] Present study result revealed a significant association between adherence rate of $\leq 95\%$ and duration of ART. Similar findings was seen in studies done by Wasti *et al.*^[10] and Achappa *et al.*^[2] and Lal *et al.*^[7] Furthermore, as in a previous study,^[7] the present study showed a statistically significant association between opportunistic infection and adherence to ART. Saha *et al.*, however, disagree with the present study that opportunistic infection has any association with adherence.^[6] The present study also shows a statistically significant positive association between adherence

and duration of ART. This finding is in accordance with a study that shows compliance was better in those who are on treatment for longer duration,^[11] whereas findings by Wasti *et al.*^[10] and Rajesh *et al.*^[9] show that duration of treatment is not a potential factor in affecting the adherence to ART. The present study showed no statistically significant association between distance traveled by the patients and adherence rate. This is in concordance with a study done in Rajasthan which found that distance traveled by HIV-positive individuals had no significant effect on the compliance rate.^[12] Contrary to the findings of this study, Achappa *et al.*^[2] and Wasti *et al.*^[10] found a significant association between adherence rate and distance traveled. Our study did not find any association between seropositive status of their partners and nonadherence; this finding was not consistent with Johnson *et al.*^[13] In the present study, patient's individual income was not found to have significant association with adherence. These findings are in accordance with other studies.^[14-21]

Limitations

Since this is a hospital record-based study, measuring the accurate burden of nonadherence in the community was impossible. Various reasons for low adherence to the treatment could not be studied. Though this ART center caters to the nearby three districts and bordering state like West Bengal, our study group was predominant from one district; focusing the patients of one district might affect its generalizability to other similar health-care facilities, since adherence was calculated on the basis of self-reporting methods of assessment that can lead to possible bias. Finally, the cross-sectional study design has its own limitations.

Conclusion

In conclusion, findings from the present study showed that proportion of patients showing $\leq 95\%$ adherence to ART was found to be 35.8%, though this percentage is higher compared to studies conducted in northern India. In our study, the duration of treatment and opportunistic infection affected the adherence rate significantly. Intersectoral coordination between family physicians and public health professionals is highly essential as they must investigate individuals, institutional and environmental factors which can possibly affect adherence to ART, and further, they can prevent new cases in the community by appropriate counseling and motivation to PLWHA. Further studies are necessary to investigate reasons for poor adherence in these districts of Odisha.

Recommendation

Policy makers must work toward policies that encourage patients to achieve optimal adherence levels. Further community-based studies are recommended in this district for timely detection of nonadherence rate and appropriate monitoring of patients. Education program should be planned in order to prevent LFU and to achieve optimal adherence to ART treatment.

Financial support and sponsorship

Nil.

Conflict of interest

There is no conflict of interest.

References

- World Health Organisation (WHO). Adherence to long term therapies: Evidence for action. WHO; 2010. Available from: [http://www.ijcm.org.in/www.who.int/chp/"_blank](http://www.ijcm.org.in/www.who.int/chp/) www.who.int/chp/knowledge/publications/adherence_report/en/. [Last accessed on 2018 Nov 03].
- Achappa B, Madi D, Bhaskaran U, Ramapuram JT, Rao S, Mahalingam S. Adherence to antiretroviral therapy among people living with HIV. *N Am J Med Sci* 2013;5:220-3.
- Uwakwe KA, Iwu AC, Diwe KC, Duru CB, Merenu IA. Socio-demographic determinants of compliance to scheduled clinic appointments among HIV patients in a Tertiary Hospital in a Resource Limited Setting in Nigeria. *Journal of Medical Education and Training* 2017;1:025.
- Shukla M, Agarwal M, Singh JV, Tripathi AK, Srivastava AK. Nonadherence to antiretroviral therapy among people living with HIV/AIDS attending two Tertiary Care Hospitals in District of Northern India. *Indian J Community Med* 2016;41:55-61.
- Mehta KG, Baxi R, Patel S, Parmar M. Drug adherence rate and loss to follow-up among people living with HIV/AIDS attending an ART Centre in a Tertiary Government Hospital in Western India. *J Family Med Prim Care* 2016;5:266-9.
- Saha R, Saha I, Sarkar AP, Das DK, Mishra R, Bhattacharya K, *et al*. Adherence to highly active antiretroviral therapy in a tertiary care hospital in West Bengal, India. *Singapore Med J* 2014;55:92-8.
- Lal V, Kant S, Dewan R, Rai SK, Biswas A. A two site hospital-based study on factors associated with noncompliance to highly active antiretroviral therapy. *Indian J Public Health* 2010;54:179-83.
- Caulbeck MB, O'Connor C, O'Connor MB, Saunders JA, Rao B, Mallesh VG, *et al*. Adherence to anti-retroviral therapy among HIV patients in Bangalore, India. *AIDS Res Ther* 2009;6:7.
- Rajesh R, Sudha V, Varma DM, Sonika S. Association between medication adherence outcomes and adverse drug reactions to highly active antiretroviral therapy in Indian human immunodeficiency virus- positive patients. *J Young Pharm* 2012;4:250-60.
- Wasti SP, Simkhada P, Randall J, Freeman JV, van Teijlingen E. Factors influencing adherence to antiretroviral treatment in Nepal: A mixed methods study. *PLoS One* 2012;7:e35547.
- Ishwar SH, Shivashankarappa A, Chandrashekar K, Kaulgud RS. A Study of compliance to ART among HIV-infected patients at a tertiary care hospital in North Karnataka. *J Clin Diagn Res* 2016;10:27-31.
- Sharma M, Rathore M, Kashyap A, Kumar C. Non-compliance to antiretroviral therapy: Road blocks and possible solutions. *Indian Medical Gazette*, 2015. [Medind.nic.in](http://medind.nic.in).
- Johnson MO, Dilworth SE, Taylor JM, Darbes LA, Comfort ML, Neilands TB. Primary relationships, HIV treatment adherence, and virologic control. *AIDS Behav* 2012;16:1511-21.
- Vedhanayagam M, Rajagopalan R, Rajendran BB, Sengodan S, Sengodan S. Factors associated with anti-retroviral therapy adherence among people living with HIV visiting IRT Perundurai Medical College Hospital Link ART Centre, Perundurai, Tamilnadu, India. *Int J Adv Med* 2016;3:982-8.
- Uria GA, Midde M, Naik PK. Socio-demographic risk factors associated with HIV infection in patients seeking medical advice in a rural hospital of India. *J Public Health Res* 2012;17:79-82.
- Joshi B, Chauhan S, Pasi A, Kulkarni R, Sunil N, Bachani D. Level of suboptimal adherence to first line antiretroviral treatment and its determinants among HIV positive people among HIV positive people in India. *Indian J Med Res* 2014;140:84-95.
- UPSACS (Facts and figures). Available from: http://upsacs.nic.in/list_20_of_20_art20centre.html. [Last accessed on 2018 Nov 03].
- Rai S, Mahapatra B, Sircar S, Raj PY, Venkatesh S, Shaikat M, *et al*. Adherence to antiretroviral therapy and its effect on survival of HIV-infected individuals in Jharkhand, India. *PLoS One* 2013;8:e66860.
- Bhuvana KB, Hema NG, Patil RT. Prevalence and risk factors for opportunistic infection in HIV patients who developed adverse drug reactions to ART in a tertiary-care teaching hospital. *Natl J Physiol Pharm Pharmacol* 2015;5:200-6.
- Park K. Park's Textbook of Preventive and Social Medicine. 24th ed. Jabalpur: Banarsidas Bhanot Publishers; 2017. p. 361.
- Gokran A, Narkhede MG, Pardeshi GS, Doibale MK. Adherence to antiretroviral therapy. *J Assoc Physicians India* 2012;60:16-20.